

IN THE CLAIMS:

Please AMEND claims 4, 10, 11, 12, 14 and 36 and CANCEL claims 32, 33 and 40 without prejudice or disclaimer in accordance with the following:

1-3. (CANCELLED)

4. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:
a positive electrode including an active material including sulfur~~lithium~~;
a negative electrode having another active material including lithium~~sulfur~~; and
an electrolyte disposed between the positive and negative electrodes, the electrolyte comprising:

a first solvent having a dielectric constant that is greater than or equal to 20;
a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane; and
an electrolyte salt, wherein:
the first solvent is between 20% inclusively and 40% by volume of the electrolyte, and
the second solvent is roughly between 80% and about 60% by volume of the electrolyte.

5-7. (CANCELLED)

8. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 4, wherein said electrolyte salt is at least one selected from a group consisting of lithium hexafluorophosphate (LiPF_6), lithium tetrafluoroborate (LiBF_4), lithium hexafluoroarsenate (LiAsF_6), lithium perchlorate (LiClO_4), lithium trifluoromethane sulfonyl imide ($\text{LiN}(\text{CF}_3\text{SO}_2)_2$), and lithium trifluorosulfonate ($\text{CF}_3\text{SO}_3\text{Li}$).

9. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 4, wherein a concentration of said electrolyte salt is roughly between 0.5 M and 2.0 M.

10. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:
a negative electrode comprising a negative active material selected from a group consisting of lithium metal, lithium-containing alloy, a combination electrode of a lithium/inactive

sulfur, a compound that can reversibly intercalate lithium ion, and a compound that can reversibly redoxitate with a lithium ion at a surface;

an electrolyte comprising a first solvent having a dielectric constant that is greater than or equal to 20, a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane, and an electrolyte salt; and

a positive electrode comprising a positive active material comprising at least one sulfur-based material selected from a group consisting of a sulfur element, Li_2S_n ($n \geq 1$), an organic sulfur compound, and a carbon-sulfur polymer $((\text{C}_2\text{S}_x)_n$ where $x=2.5$ to 50 and $n \geq 2$), and an electrically conductive material, wherein

the first solvent is roughly between 20% and 40% by volume of the electrolyte, and the second solvent is roughly between 80% and about 60% by volume of the electrolyte.

11. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:
a positive electrode including an active material including sulfur~~lithium~~;
a negative electrode including another active material including lithium~~sulfur~~; and
an electrolyte disposed between the positive and negative electrodes, the electrolyte comprising:

a first solvent having a polarity ~~high enough~~sufficient to dissolve Li_2S_n ($n = 1, 2, 4, 6, 8$)~~an ionic compound~~;

a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane; and

an electrolyte salt, wherein

the first solvent is between 20% inclusively and 40% by volume of the electrolyte, and the second solvent is roughly between 80% and about 60% by volume of the electrolyte.

12. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:
a negative electrode comprising a negative active material ~~including sulfur~~selected from a group consisting of lithium metal, lithium-containing alloy, a combination electrode of a lithium/inactive sulfur, a compound that can reversibly intercalate lithium ion, and a compound that can reversibly redoxitate with a lithium ion at a surface;

an electrolyte comprising:

a first solvent having a polarity sufficient to dissolve Li_2S_n ($n = 1, 2, 4, 6, 8$)~~a first solvent having a polarity high enough to dissolve an ionic compound,~~

a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane, and

an electrolyte salt; and

a positive electrode comprising a positive active material including lithium,~~wherein~~comprising at least one sulfur-based material selected from a group consisting of a sulfur element, Li_2S_n ($n \geq 1$), an organic sulfur compound, and a carbon-sulfur polymer $((\text{C}_2\text{S}_x)_n$ where $x = 2.5$ to 50 and $n \geq 2$)

the first solvent is roughly between 20% and 40% by volume of the electrolyte, and

the second solvent is between 60% and 80% inclusively by volume of the electrolyte.

13. (ORIGINAL) The lithium-sulfur battery of claim 12, wherein the first solvent has a dielectric constant that is greater than or equal to 20.

14. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:

a negative electrode comprising a negative active material;

an electrolyte comprising:

a first solvent having a polarity sufficient to dissolve Li_2S_n ($n = 1, 2, 4, 6, 8$)~~a first solvent having a polarity high enough to dissolve an ionic compound,~~

a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane, and

an electrolyte salt; and

a positive electrode comprising a positive active material, wherein:

the first solvent is at least one selected from a group consisting of methanol, hexamethyl phosphoramide, ethanol, and isopropanol,

the first solvent is roughly between 20% and 80% by volume of said electrolyte, and

the second solvent is roughly between 20% and about 80% by volume of said electrolyte.

15. (CANCELLED)

16. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14,
wherein:
the first solvent is roughly between 20% and 40% by volume of said electrolyte, and
the second solvent is roughly between 80% and about 60% by volume of said electrolyte.
17. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14,
wherein a ratio of the first solvent to the second solvent is roughly 1:1.
- 18-28. (CANCELLED)
29. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 4, wherein
the first solvent is at least one selected from a group consisting of ethylene carbonate, propylene
carbonate, dimethyl sulfoxide, sulfolane, γ -butyrolactone, acetonitrile, dimethyl formamide,
methanol, hexamethyl phosphoramidate, ethanol, and isopropanol.
30. (CANCELLED)
31. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 10,
wherein said first solvent is at least one selected from a group consisting of methanol,
hexamethyl phosphoramidate, ethanol, and isopropanol.
- 32-33. (CANCELLED)
34. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 10,
wherein the second solvent is substantially 80% by volume of the electrolyte.
35. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 10,
wherein the first solvent is substantially 20% by volume of the electrolyte.
36. (CURRENTLY AMENDED) The lithium-sulfur battery of claim 14, wherein the
second solvent is between ~~70~~60% and 80% inclusively by volume of the electrolyte.
37. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14,

wherein the first solvent is between 20% inclusively and 40% by volume of the electrolyte.

38. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein the second solvent is substantially 80% by volume of the electrolyte.

39. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein the first solvent is substantially 20% by volume of the electrolyte.

40-42. (CANCELLED)

43. (CURRENTLY AMENDED) An electrolyte for a lithium-sulfur battery having a positive and negative electrode, comprising:

a first solvent having a dielectric constant that is greater than or equal to 20;

a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane; and

an electrolyte salt, wherein:

said first solvent is at least one selected from a group consisting of methanol, hexamethyl phosphoramide, ethanol, and isopropanol, and

the first solvent is roughly between 20% and 80% by volume of the electrolyte.